GLOSSARY

Section 1
Terms, Abbreviations and Acronyms

=:	Equal to
<:	Less Than
>:	Greater Than
A:	Ampere
AAD:	Auxiliary Actuator Driver
AC:	Alternating Current
Accuracy:	The degree of conformity of an indicated value to a recognized accepted standard value.
Actuator:	A device that, either electrically or pneumatically operated, changes the position of a valve or damper.
AD:	Control Damper
AFMA:	Air-Flow Measurement Station
AHU:	Air-Handling Unit
AI:	Analog Input
Analog:	A signal type representing a system variable (such as temperature, humidity, or pressure) that can be measured continuously over a scale.
AO:	Analog Output
AUTO:	Automatic
Automatic Temperature Control:	A local loop network of pneumatic or electric/electronic devices that are interconnected to control temperature.
AUX:	Auxiliary
Auxiliary Actuator Driver:	An actuator circuit that can be used to control a separate actuator.

Bias:	A single-loop digital controller function which maintains a fixed difference in engineering units between controller setpoint and the remote setpoint signal to the controller in engineering units.
BLR:	Boiler
C:	Common
Cavitation:	A phenomenon that results in valve damage from too great a pressure drop through a valve.
CB:	Circuit Breaker
CC:	Cooling Coil
CDHR:	Condenser, Hydronic Return
CDHS:	Condenser, Hydronic Supply
CFM:	Cubic Feet Per Minute
CH:	Chiller
CLK:	Time Clock
Closed Loop System:	Control system configuration that allows system feedback.
COND:	Condenser
Controlled Device:	The instrument that receives the controller's output signal and regulates the controlled process.
Controlled Variable:	The temperature, humidity, or pressure value to whose variations the controller responds. Controlled variable is also called process variable.
Controller:	The instrument that measures the controlled variable and responds by producing an output signal that holds the controlled variable within preset limits.
Controller Feedback:	The change in the controller's output in response to a measured change in the controlled variable that is transmitted back to the controller's input.
Control Point:	The actual value at which a controller is holding a process variable.

Controller Configuration:	Information manually entered through a controller keyboard which selects built-in controller options and sets controller parameters.
Control Point Adjustment (CPA):	Adjustment of a controller's setpoint. The control point value may vary from the setpoint due to load offset. Control point adjustment can be accomplished by a signal generated from a local adjustment device, by a signal generated from a remote location, or by means of software.
Controls:	Devices that govern the performance of a system.
COOL:	Cooling
CPA:	Control Point Adjustment (Remote Setpoint Adjustment)
C.T.:	Cooling Tower
CUH:	Cabinet Unit Heater
C_v:	The liquid flow coefficient of a valve that has the units of gpm per psid and is used to select the valve for a required flow in the open position at a calculated pressure drop.
D:	Derivative Control Mode
DA:	Damper Actuator
DC:	Direct Current
DD:	Dual Duct
DDC:	Direct Digital Control
Deadband:	A range of thermostat output signal, between the shutoff of heating and start of cooling, in which no heating or cooling energy is used.
DEG:	Degree
Derivative (D) Mode:	Control mode in which the output is proportional to the rate of change of the input.

Deviation Contact (DEV):	A single-loop digital controller output contact that can be configured to respond to a given difference between the setpoint of the controller and the process variable input signal.
DI:	Digital Input
DIA:	Diagram
Differential:	The difference in values of the controlled variable that will cause a two-position controller to change its output.
Differential Pressure:	The difference between the static pressures measured at two points in an HVAC system.
Direct Acting:	An output signal that changes in the same direction as the controlled or measured variable. An increase in the controlled or measured variable results in an increase in the output signal.
DMPR:	Damper
DO:	Digital Output
DPI:	Differential-Pressure Gauge
DPDT:	Double-Pole, Double-Throw
DPS:	Differential-Pressure Switch
DPST:	Double-Pole, Single-Throw
DPT:	Differential-Pressure Transmitter
DX:	Direct-Expansion Coil
EA:	Each
EC:	Economizer Controller
ECON:	Economizer
Economizer Mode:	The control system mode of operation in which outside air is used for free-cooling of building spaces.
EF:	Exhaust Fan

EMCS:	Energy Monitoring and Control Systems used in military facilities for supervisory control of HVAC control systems and energy related monitoring and control functions.
EP:	The acronym for a two-position electric-solenoid-operated 3-way air valve. (Electric to pneumatic.).
Equipment Schedule:	A listing of control devices by loop function, unique identifier, setpoints, ranges, and other parameters.
ES:	End Switch
EXH:	Exhaust
F:	Fahrenheit, Friday
FC:	Flow Controller
FCU:	Fan-Coil Unit
FE:	Flow-Sensing Element
FLTR:	Filter
FPM:	Feet Per Minute
FPS:	Feet Per Second
Free-Cooling:	Cooling without mechanical refrigeration.
FT:	Flow Transmitter
FTR:	Finned-Tube Radiator
Function Module:	A device for performing a control-loop function between the transmitter and the controller or between the controller output and the controlled devices.
Gain:	The amount of change in controller output per unit change of controller input.
GC:	Glycol Coil
GPM:	Gallons Per Minute
H:	High
HC:	Heating Coil
HD:	Head

Heat:	Heating
HFER:	Humidifier
HL:	High Limit
HOA:	Hand-Off-Automatic
HP:	Horsepower
HPS:	High-Pressure Steam
HR:	Heat Recovery
HRC:	Heat-Recovery Coil
HRS:	Hours
HS:	Manual Switch
HTHW:	High-Temperature Hot Water
HVAC:	Heating, Ventilating, and Air Conditioning
HWS:	Hot Water Supply
HX:	Heat Exchanger (Converter)
Hydronic:	A term used to describe HVAC systems using liquid heating and cooling media.
HZ:	Cycles Per Second (Hertz)
I:	Integral Control Mode
IH:	Infrared Heater
Input Signal:	The variable signal, received by an instrument, which provides that instrument with a means of changing its output signal.
INV:	Signal-Invertor Module
IO:	Input/Output
IP:	The acronym for a current to pneumatic signal transducer. (I for current and P for pneumatic.)
Integral (I) Mode:	Control mode in which the output is proportional to the time integral of the input; i.e., the rate of change of output is proportional to the input.

IV:	Inlet Vane
K_v:	The liquid flow coefficient of a valve that has the units of m^3/hr per 100 kPa pressure drop and is used to select the valve for a required flow in the open position at a calculated pressure drop.
kPa:	Kilo-Pascal
L1, L2, N:	Control-Power Lines and Neutral
L:	Low
Ladder Diagram:	A diagram that shows the electrical control-logic portion of a control system.
LD:	Loop Driver
LDR:	Ladder
Linearity:	A relation such that any change of input signal is accompanied by a similar output change that is directly proportional to the input.
Local-Loop Control:	The local pneumatic or electric/electronic controls for any system or subsystem.
LOC:	Location
Loop Driver:	A device used in control loops to assure that the single-loop digital controller will not be required to drive a loop with a greater impedance than 600 ohms.
LPS:	Low-Pressure Steam
L/s:	Liters per second
LTHW:	Low-Temperature Hot Water
M:	Main Air, Motor, Monday
MA:	Milliamp
MAN.:	Manual

Manual Reset:	The act of manually restoring control-circuit electrical continuity after the circuit has been opened by a safety device. A feature of the single-loop digital controller that allows manual adjustment of the analog output signal when proportional mode control is used without integral mode control or derivative mode control.
Measured Variable:	The uncontrolled variable (such as temperature, relative humidity, or pressure) sensed by the measuring element.
Microprocessor Controller:	A microprocessor-based controller (non-analog in processing its internal signals) that performs a dedicated function and does not require software programming.
MIN:	Minimum
Minimum-Position Switch:	A manual switch used to set the position of mixing plenum control dampers to assure that the minimum quantity of outside air is introduced by an HVAC system.
MO1, MO2:	Magnetic-Starter Holding coil
Modulating Control:	Control achieved by gradually changing a controller analog output signal to an actuator in response to a change in a sensed variable.
MPS:	Minimum-Position Switch
M/S:	Meters per second
MZ:	Multizone
Normally Closed:	A controlled device that closes when its power supply or input signal is removed.
Normally Open:	A controlled device that opens when its power supply or input signal is removed.
Normal Mode:	The usual or expected operating condition.
OA:	Outside Air
OCC:	Occupied
Offset:	The difference between the setpoint of a controller and the actual control point of the controlled variable, caused by changes in load.

OL:	Overload
Open-Loop System:	Control-system configuration that does not have system feedback.
OUT:	Output
Output Signal:	A signal produced in response to an input.
P:	Proportional Control Mode
Pa:	Pascal
Parameter:	Information and values to be used in configuring a microprocessor controller for its purpose in the control-system application.
PB:	Proportional Band
PC:	Outside-Air Preheat Coil, Pressure Controller
PE:	Pneumatic-Electric Switch
PH:	Phase
PI:	Pressure Indicator (Gauge) or Proportional-Plus-Integral Control Mode
PID:	Proportional-Plus-Integral-Plus Derivative Control Mode
PL:	Pilot Light
Positive Positioner:	A mechanical device that measures actuator position and control signal value and sends main air to the actuator to maintain the correct position for the signal.
PP:	Positive Positioner
Process Control:	The science of regulating variables by measuring, processing, and manipulating process variables coupled to the regulated variables.
Process Variable:	See Controlled Variable.
Process Variable Contact (PV):	A single-loop digital controller output contact that can be configured to respond to a given value of the process variable input signal.
PROP:	Proportional

Proportional Band:	A controller parameter setting which determines the change in the number of engineering units of a process variable input signal that will produce a full-scale change of the controller analog output signal.
Proportional (P) Mode:	Control mode in which there is a continuous linear relationship between the input and the output.
Proportional-Integral (PI) Mode:	Control mode in which the output is proportional to a linear combination of the input plus a value proportional to the time integral of the error between setpoint and control point.
Proportional-Integral-Derivative (PID) Mode:	Control mode in which the output is a value proportional to the input, plus a value proportional to the time integral of the error between setpoint and control point plus a value proportional to the time rate of change of the error.
PSI:	Pounds Per Square Inch
PSIA:	Pounds Per Square Inch, Absolute
PSID:	Pounds Per Square Inch, Differential
PSIG:	Pounds Per Square Inch, Gauge
PV:	Process Variable
R:	Relay
RA:	Return Air
Range:	The upper and lower limits of the value of a variable.
Ratio:	A single-loop digital controller feature which multiplies the remote setpoint input signal to the controller by a constant and uses the resulting value as the controller setpoint.
Relay:	An electric device that changes the position of its contacts when its coil is energized.
Remote Setpoint:	See Control Point Adjustment.
Resistance Temperature Detector (RTD):	A device whose resistance changes linearly as a function of temperature.
REV:	Reverse-Acting

Reverse Acting:	An output signal that changes in the opposite direction from the controlled or measured variable. An increase in the controlled or measured variable results in a decreased output signal.
RF:	Return Fan
RH:	Relative Humidity
RHC:	Relative-Humidity Controller, Reheat Coil
RHT:	Relative-Humidity Transmitter
RHY:	Humidity Loop Device
SA:	Supply Air
SAT:	Saturday
Schematic:	A diagram that shows the relationship of control devices to control loops and shows the relationship of control loops to systems.
SCIM:	Standard Cubic Inches Per Minute
Self-Tuning:	A single-loop digital controller feature that, when selected, commands the controller to calculate the optimal proportional, integral and derivative mode constants for the process being controlled and to use the calculated constants for control.
Sensitivity:	The unit change in controller output per unit change in the controlled variable. Usually expressed in psi or milliamps per degree, cfm, etc.
Sensing Element:	A device used to detect or measure physical phenomena.
Sequence of Operation:	A narrative that describes the actions of control devices such as valves and dampers as the process variable changes in a given direction, such as on a temperature, humidity, or pressure increase.
Setpoint:	The desired value of the controlled variable at which the controller is set.
SF:	Supply Fan
SHLD:	Sunshield

Signal Inverter:	A device that linearly converts a 4 to 20 milliampere input signal to an output signal of 20 to 4 milliamperes.
Signal Selector:	A device that selects the highest or the lowest of its input signals as its output signal.
SLDC	Single Loop Digital Controller - A controller that accepts analog input signals, processes the signals digitally according to the controller configuration, and, as a result, produces analog output and two-position output signals.
SMK:	Smoke Detector
Smoke Detector:	A generic term for devices that are used to operate safety circuits on the detection of smoke or products of combustion.
SP:	Static Pressure
S.P.:	Setpoint
Span:	The number of engineering units between the extremes of a calibration range.
SPRG:	Spring Range
Spring Range:	The range over which the input signal to a controlled device must change to move the device from one extreme to the other.
SPT:	Static-Pressure Transmitter
SQCR:	Sequencer
STM:	Steam
SUN:	Sunday
Sunshield:	A device installed outdoors on the surface of a building to house outside-air temperature-sensing elements and to shield them from direct exposure to sun's radiation.
Supply Pressure:	Gauge pressure of the compressed air supplied to a pneumatic control system, usually 140 kPa (20 psig).
Supply Voltage:	Voltage of the electric energy supply to an electric/electronic control system.

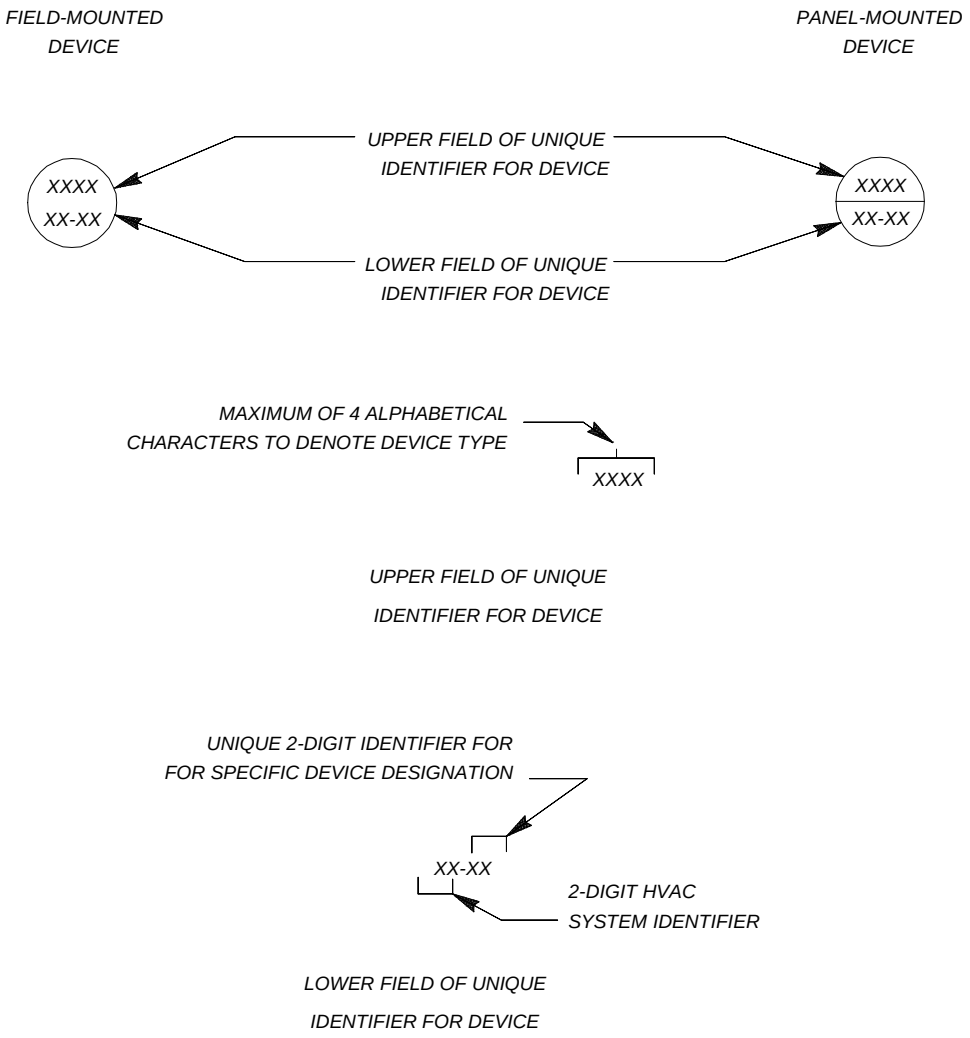
Surge Protection:	Methods of protecting signal wiring and power wiring circuits from damage by electrical voltage and current overrange due to such factors as lightning strikes.
System Feedback:	System's response to the controller's action in changing the value of a controlled variable, as transmitted back to the controller.
SZ:	Single Zone
T:	Modulating Thermostat, Tuesday
TC:	Temperature Controller
TDR:	Time Delay Relay
TE:	Temperature-Sensing Element
TEMP:	Temperature
Terminal Unit:	A unit through which heating or cooling is distributed to the conditioned space. Terminal units include radiators, unit heaters, gas-fired infrared heaters, variable-air-volume boxes, duct heating coils, and fan-coil units.
TH:	Thursday
Thermostat:	A device that senses temperature and changes its output as a result of temperature changes.
Throttling Range:	The portion of the instrument range of a controlled variable required to move the controlled device from one extreme to the other.
TI:	Thermometer
Time Clock:	A device that changes the positions of its output contacts according to a timing schedule.
Transmitter:	A transducer that senses the value of a variable and converts this value into a standardized transmission signal.
TS:	Non-Modulating Space Thermostat or Aquastat
TSL:	Low-Temperature-Protection Thermostat or Nightstat, Non-modulating

TSP:	Temperature-Setpoint Device
Tuning:	The process of finding the control-mode constants the use of which results in the stable control of a process at or near the controller setpoint.
TuP:	Microprocessor Room Thermostat
TT:	Temperature Sensor and Transmitter
Two-Position Control:	Control achieved by switching a controller output signal on and off in response to a change in a sensed variable.
TY:	Temperature Loop Device
UH:	Unit Heater
Unique Identifier:	An alphanumeric identifier that consists of: 1) an abbreviation for the type of device; and 2) a number made up of an HVAC-system number and a serial number for the device.
UNOCC:	Unoccupied
VAV:	Variable Air Volume
VFDU:	Variable-Frequency Drive Unit
VLV:	Valve
W:	Wednesday
WTR:	Water
X1, X2:	transformer Power, Hot and Ground
X:	Times (Multiplication)
XMFR:	Transformer

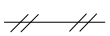
Section II
Standard Symbols

This section contains the symbols which will be used for HVAC control system drawings produced in accordance with this Engineering Instruction.

Each symbol will be referenced to a unique identifier, which will use the following format:



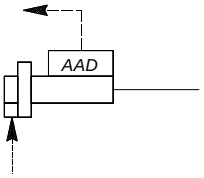
Instrumentation and control device sysmbols for HVAC control system drawings are as follows:



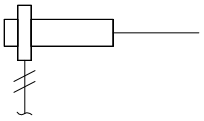
PNEUMATIC LINE

ELECTRIC LINES (LADDER DIAGRAMS ANDSCHEMATICS)

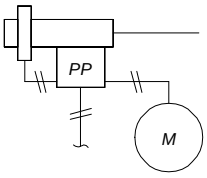
ELECTRONIC SIGNALS (SCHEMATICS)



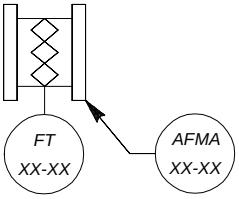
ACTUATOR, ELECTRIC OR ELECTRONIC



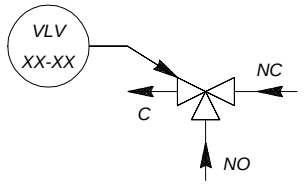
ACTUATOR, PNEUMATIC



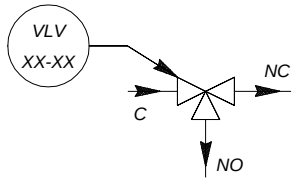
ACTUATOR, PNEUMATIC WITH POSITIVE POSITIONER



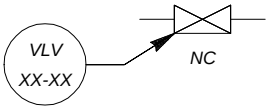
AIR-FLOW MEASURING STATION AND TRANSMITTER



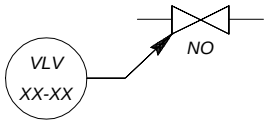
VALVE, 3-WAY MIXING



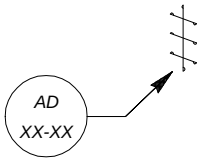
VALVE, 3-WAY DIVERTING



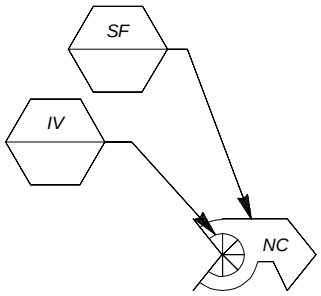
2-WAY VALVE, NORMALLY CLOSED



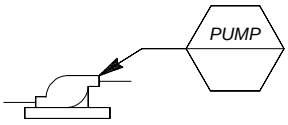
2-WAY VALVE, NORMALLY OPEN



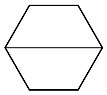
DAMPER, PARALLEL-BLADE WITH SEALS



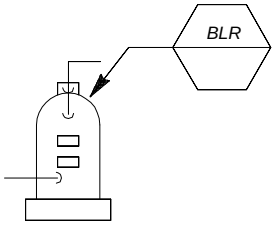
FAN, WITH INLET GUIDE VANES



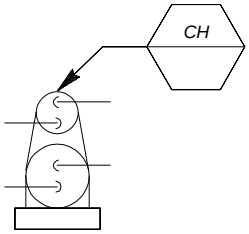
PUMP



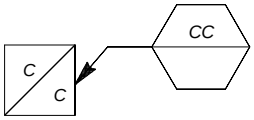
HVAC EQUIPMENT IDENTIFIER



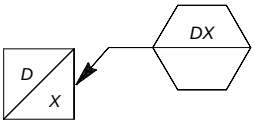
BOILER



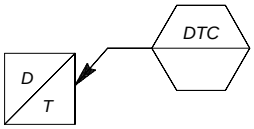
CHILLER



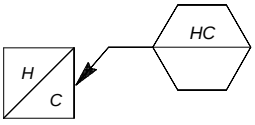
COIL, COOLING



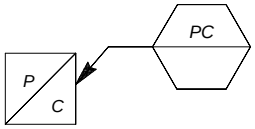
COIL, COOLING, DIRECT-EXPANSION



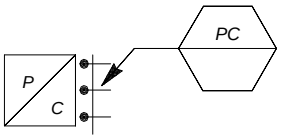
COIL, DUAL TEMPERATURE



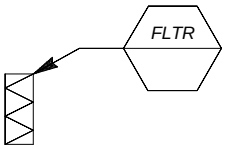
COIL, HEATING



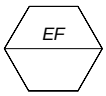
COIL, OUTSIDE-AIR PREHEAT



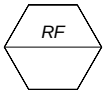
COIL, OUTSIDE-AIR PREHEAT
FACE & BYPASS DAMPER



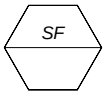
FILTER



EXHAUST FAN



RETURN FAN

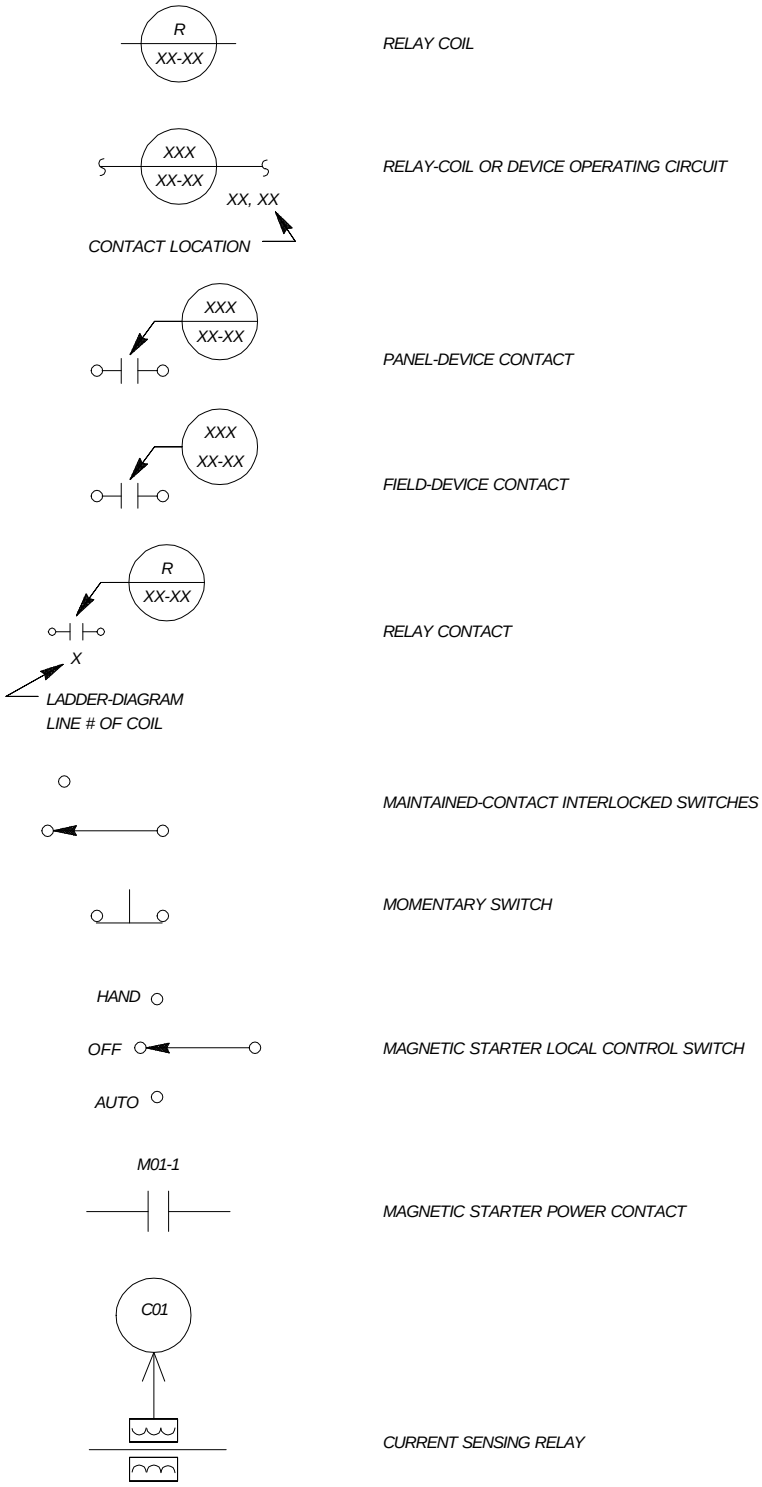


SUPPLY FAN

THERMOWELL

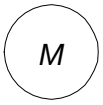
MAIN AIR

FIELD-MOUNTED PRESSURE GAUGE


R
XX-XX
RELAY COIL
XXX
XX-XX
XX, XX
CONTACT LOCATION
RELAY-COIL OR DEVICE OPERATING CIRCUIT
XXX
XX-XX
PANEL-DEVICE CONTACT
XXX
XX-XX
FIELD-DEVICE CONTACT
R
XX-XX
X
LADDER-DIAGRAM
LINE # OF COIL
RELAY CONTACT
MAINTAINED-CONTACT INTERLOCKED SWITCHES
MOMENTARY SWITCH
HAND
OFF
AUTO
MAGNETIC STARTER LOCAL CONTROL SWITCH
M01-1
MAGNETIC STARTER POWER CONTACT
C01
CURRENT SENSING RELAY

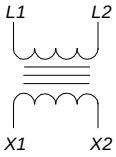
MAGNETIC STARTER CIRCUIT BREAKER

MAGNETIC STARTER CONTROL-CIRCUIT FUSE

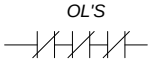


MOTOR

MAGNETIC STARTER HOLDING COIL



MAGNETIC STARTER CONTROL CIRCUIT TRANSFORMER



MAGNETIC STARTER OVERLOADS

HUMIDITY SWITCH CONTACT
(MAKES ON HUMIDITY INCREASE)

HUMIDITY SWITCH CONTACT
(BREAKS ON HUMIDITY INCREASE)

PRESSURE SWITCH CONTACT
(MAKES ON PRESSURE INCREASE)

PRESSURE SWITCH CONTACT
(BREAKS ON PRESSURE INCREASE)

TEMPERATURE SWITCH CONTACT
(MAKES ON TEMPERATURE RISE)
(BREAKS ON TEMPERATURE FALL)

TEMPERATURE SWITCH CONTACT
(BREAKS ON TEMPERATURE RISE)
(MAKES ON TEMPERATURE FALL)

TIME CLOCK

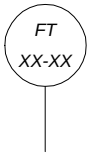
DIFFERENTIAL PRESSURE SWITCH

DIFFERENTIAL PRESSURE TRANSMITTER

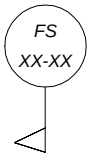
ECONOMIZER CONTROLLER

ELECTRIC-SOLENOID-ACTUATED PNEUMATIC VALVE

FLOW CONTROLLER



FLOW TRANSMITTER, DUCT-MOUNTED



FLOW SWITCH

CURRENT-TO-PNEUMATIC TRANSDUCER

LOOP DRIVER

MINIMUM-POSITION SWITCH

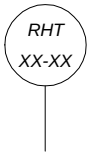
PRESSURE CONTROLLER

PANEL-MOUNTED PRESSURE GAUGE

PRESSURE TRANSMITTER

RELATIVE HUMIDITY CONTROLLER

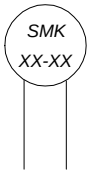
HI-LIMIT HUMIDISTAT, NON-MODULATING



RELATIVE HUMIDITY TRANSMITTER, DUCT-MOUNTED

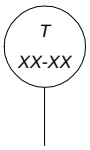
RELATIVE HUMIDITY TRANSMITTER, SPACE-MOUNTED

SIGNAL SELECTOR, HUMIDITY CONTROL LOOP



SMOKE DETECTOR, DUCT-MOUNTED

MODULATING SPACE THERMOSTAT

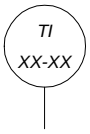


MODULATING DUCT THERMOSTAT, NON-AVERAGING

MODULATING DUCT THERMOSTAT, AVERAGING

TEMPERATURE CONTROLLER

THERMOMETER, AVERAGING

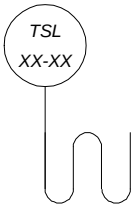


THERMOMETER, NON-AVERAGING

NON-MODULATING SPACE THERMOSTAT,
(MAKES/BREAKS CONTACTS ON TEMPERATURE RISE)

NON-MODULATING SPACE THERMOSTAT,
(MAKES CONTACT ON TEMPERATURE RISE)

NIGHT THERMOSTAT, NON-MODULATING
SPACE THERMOSTAT, (BREAKS CONTACT
ON TEMPERATURE RISE)

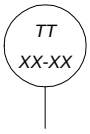


THERMOSTAT, LOW-TEMPERATURE PROTECTION

MANUAL TEMPERATURE SETPOINT DEVICE

SPACE TEMPERATURE TRANSMITTER

TEMPERATURE TRANSMITTER, AVERAGING



TEMPERATURE TRANSMITTER, DUCT-MOUNTED

MICROPROCESSOR-BASED SPACE THERMOSTAT

SIGNAL SELECTOR, TEMPERATURE CONTROL LOOP